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ABSTRACT

Through a faculty retirement survey and a review of the literature, Clemson University, South Carolina, studied the future labor market for college faculty. The survey was administered to 1,250 faculty at the university in Fall, 1991. Fifty-six responded with data indicating that the College of Sciences, and the College of Agricultural Sciences will be most affected by retirement in the coming decade. Engineering has fewer prospective retirees, and Architecture, Nursing, and Commerce and Industry are least threatened by faculty retirement in the next decade. An examination of overall market conditions found that the baby boom will continue to exert an important influence on the labor market, and that the size of the pool of students in the coming decade is unclear. A look at broad trends in specific disciplines and groups of disciplines nationally and at Clemson found that departments in Agriculture and Natural Resources are encountering an aging faculty and diminishing enrollments; that the faculty in business disciplines are relatively young; that the patterns of retirements and replacement pools in education follow general trends in other disciplines; that a shortage of engineering faculty continues; that Forestry and Parks, Recreation and Tourism Management enjoy strong enrollments; that a long oversupply and underemployment in liberal arts is coming to an end; that nursing is experiencing increases in enrollment; and that the sciences face falling enrollments. Included are 3 graphs and 23 notes. (JB)

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Prospects for the Faculty Labor Market _____ in the 1990s A Clemson University Perspective

Report by the Environmental Scanning Committee
Dr. Holley Ulbrich, Chairperson

to the Strategic Planning Committee
Dr. C. Stassen Thompson, Chairman

February, 1991

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I INTRODUCTION

A great deal of interest and attention has been focused on the labor market for college faculty in the last few years. While in many respects it is like any labor market, there are a few peculiar features that are worth noting and that affect institutional planning for replacing and expanding the academic workforce.

First, a new faculty member is the result of a rather lengthy production process from bachelor's to terminal degree, often with detours in between to other activities. The "production" of a faculty member can be speeded up in various ways, such as hiring faculty at an earlier stage of their own educational process (e.g., without dissertation completed), but there are limits to the amount of increased faculty that can be generated by such stratagems. This long production period means that the response to changing market conditions is slow, creating a cyclical pattern of shortages and surpluses with brief intervening periods of market equilibrium in most disciplines.

Second, universities are in the peculiar position of being both the producer and the chief employer of the professoriate. Although universities hire very few of their own graduates, they do hire from one another. Thus, the higher education community has reason to be concerned about the state of the academic labor market from both the buyer's and the seller's perspective.

On the buying side, academic market conditions affect the ability of any given university with their ability to compete in the marketplace to hire new faculty to meet replacement and expansion needs. On the selling side, universities are generally interested in employment opportunities for their graduates, especially since those prospects affect the size of the pool of graduate students and graduate assistants.

Clemson University, like any university, is more or less a price taker in the faculty market in most disciplines. Our university does not have a significant influence on the market, but is influenced by changes in national market conditions for faculty members. Thus, we need to explore both the consensus view of expected demand for replacement and expansion and supply factors as well as some dissenting views. A market overview constitutes the second section of this paper. The third section looks at market conditions by discipline, both nationally and at Clemson. The final section attempts to draw some policy conclusions for purposes of strategic planning at Clemson University.

II OVERALL MARKET CONDITIONS

The most salient fact that has affected the academic labor market for the last two decades and will continue to do so is the peculiar demographics of the last half of the twentieth century. As the baby boom bulge has moved through the population as a whole, this group

created a market for the pre-baby boom generation of faculty members trained and hired in the 1960s and early 1970s to meet burgeoning demands on colleges. Those faculty members are approaching retirement in terms of age and years of service, and the pool of potential replacements is shrinking. At the same time, there is considerable uncertainty about the size of the pool of students to be taught in the next decade. Thus, projections of the overall faculty labor market are fraught with uncertainty, but a limited supply of qualified faculty is the most frequent prediction.

In addition to the overall labor market, there is great interest in subsets in specific disciplines. Physics, for example, is not only a local concern but a national one; the average age of a physics professor is the oldest of any of the basic disciplines. Half of the nation's physics professors are 49 or older, compared to an average of 39 percent for all arts and sciences disciplines.¹ At Clemson, it is estimated that about two-thirds of the physics department that was in place in 1989 will have retired by 1999. Mathematics, on the other hand, is the youngest of the basic disciplines, with only 31 percent in the 49+ age bracket. Thus, replacement demand and any expansion in demand for faculty members will meet very different market conditions in different disciplines.

The Environmental Scanning Committee conducted a faculty survey of retirement intentions in the fall of 1990. A total of 701 faculty members, or 56.4 percent, responded to the survey. The survey results were consistent with national trends, with the largest prospective retirements in Sciences, followed by Agriculture. Engineering has fewer prospective retirees, and Architecture, Nursing, and Commerce and Industry are least threatened by faculty retirement in the next decade. A complete summary of the survey is provided in Appendix 1.

Two important national studies provide some insights into the future of faculty labor markets in the next ten to twenty years. One is William Bowen and Julie Ann Sosa's *Prospects for Faculty in the Arts and Sciences*. The other is Howard Bowen and Jack Schuster's study entitled *American Professors: A National Resource Imperiled*.² Neither study is optimistic about the number of qualified, English-fluent, bright persons available to hiring committees in the future. Bowen and Sosa predict shortages (less than one qualified applicant per position) beginning in 1997. Bowen and Schuster examine faculty attrition, non-academic sources of supply, and the likely supply of new doctorates, and conclude that the supply will be quite tight, particularly in disciplines competing with non-academic openings for persons with advanced degrees.

After the rapid growth in faculties in the 1960s, the 1970s and early 1980s were marked by an excess supply of qualified applicants in most basic disciplines, according to Bowen and Sosa. Opportunities in the next ten to twenty years will come primarily from replacement demand, with some modest expansion due to growth of the student population. Most of the attention has focused on the first factor, which is replacement demand.

REPLACEMENT DEMAND: RETIREMENT, EXITS, AND DEATH

Bowen and Sosa do not project a bunching of retirements but rather a steady exit rate through retirement (and death) of about 11-13 percent in each of the next five year periods

through the year 2002. Combining retirements with vacancies created by those who leave academia (rather than shifting to another institution) and deaths, Bowen and Schuster project a loss rate requiring replacements of about 4 percent per year, 1.3 percent through death or retirement and the remainder from all other reasons (shift to administration, shift to part-time, movement to non-academic positions, leaving the labor force, or emigration). They project a slight rise in this 4 percent rate over time to as much as 6 percent by the end of the decade because of increasing age of the current faculty, and a larger proportion of women (who have higher turnover rates), as well as more relatively attractive non-academic opportunities. These projected loss rates amount to about 20 percent over the first five-year period, rising to closer to 30 percent in later periods—considerably higher than the Bowen and Sosa projection. Thus, Bowen and Sosa do not project excess demand for faculty until 1997; Bowen and Schuster anticipate that those seeking to fill positions will encounter tighter conditions somewhat sooner.

A 1988 survey of faculty at all institutions found that 23 percent of regular full-time faculty have made plans to quit (including moving to another institution) or to retire, with about one-third of those planning to retire in the near future.³ This figure is not inconsistent with the Bowen and Schuster figure of 1.3 percent a year over a time horizon of five to six years.

One of the earlier studies of prospects for faculty retirement at Clemson in the 1990s was conducted in 1985 by a faculty senate committee. This committee's report examined the age structure and years of service of tenure track faculty in 1980–81 and 1984–85. The committee found an age cohort of significant size passing through the faculty, with a mode in the 35–39 age range in 1980–81 that became a mode of 40–44 in 1984–85. This age cohort represents faculty hired during the significant expansion in Clemson enrollment in the late 1960s and early 1970s. This group is now in their early 50s, many of them approaching 30 years of service. Even without early retirement, the pool of potential retirees identified in that study continues to represent a higher percentage of the Clemson faculty than in earlier periods.

At the request of the Environmental Scanning Committee, David Fleming of the Office of Institutional Research used personnel records to determine how many faculty are eligible to retire by the year 2000.⁴ The Office of Institutional Research has identified 110 faculty eligible to retire from Clemson University between 1990 and 1995 and an additional 119 who will be eligible to retire between 1996 and 2000 with either 30 years of service or at age 65. These two figures add to 28 percent of the faculty (229) who will have either 30 years of service or attain age 65 over this decade (An unknown number will become eligible for early retirement at age 55 with 25 years of service). The faculty retirement survey found that 17.9 percent of those responding had actually made plans to retire during that period. In the College of Sciences, 39 percent will be eligible for full retirement benefits, and according to the survey, 21 percent have reported an intention to retire.

Fleming also notes that turnover is quite costly, particularly in agriculture, engineering, and the sciences. Recruiting and moving costs about \$10,000 to \$15,000 per faculty member. In agriculture, engineering, and sciences, he estimates that there will be an additional cost

of \$100,000 to \$150,000 per faculty member to set up a research laboratory, depending on the research area and the possibility of using existing equipment. Outlays for these two categories in order to replace all eligible faculty if they retire between now and the year 2000 will be \$2.9 million for the recruitment and moving expenses, and \$16.9 million in research set-up costs, or an average combined cost of about \$2 million a year.

NEW POSITIONS DUE TO EXPANDING ENROLLMENT

In addition to replacement demand, a second source of demand for faculty members is to meet expanding enrollment, to increase the faculty-student ratio, and to meet demands for faculty members in other areas, such as research, public service, and administration. According to Bowen and Sosa, at current faculty-student ratios, the overall faculty demand in order to meet changes in enrollment will be stable or falling to 1997, then rising. That is, falling enrollment will offset some of the loss of faculty to retirement, death, or non-academic employment. This factor is the primary foundation for their projection that the supply of faculty members will be more than adequate through 1997. Bowen and Schuster, likewise, project a rising enrollment after 1996, although it is qualified by a number of factors that can affect the student population.

A more detailed projection of student enrollment is presented by Arthur Levine and Associates (*Shaping Higher Education's Future*).⁵ The pool of traditional college students, directly out of high school, will reach its low point in 1992, with modest increases until 1997 and more rapid increases in the following years. Nevertheless, in 1998, the number of eighteen-year-olds will still be less than in 1979. The pattern shows regional variation, with the largest drop in the Northeast and the second largest drop in the South. The share of high school graduates who enter college within a year of graduation has risen somewhat from 45 percent in 1974 to 56 percent in 1986. A higher rate of college matriculation has somewhat cushioned the impact of a smaller cohort of eighteen-year-olds in the last ten years.

Minorities have somewhat different patterns of high school completion and college enrollment than the white majority. These differences are important because the black, Hispanic, and Asian populations are growing more rapidly than the white population. Blacks and Hispanics have lower rates of college attendance than average, while Asians have higher rates. South Carolina has relatively few Hispanics or Asians but a substantial black population. Although a larger share of black students nationally have been completing high school in recent years, their rate of enrollment in college has declined from 33.5 percent in 1976 to 26.1 percent in 1985. A higher percentage of black high school graduates than whites choose to attend vocational/technical schools or enlist in the military. Clemson University has had some significant and successful programs aimed at encouraging black students to attend college and to consider majors such as engineering, but such efforts must be continued and expanded to remain competitive in attracting students in the next decade.

Still another important group that has offset the decline in the traditional pool of students are persons over the age of 25, who now constitute 40 percent of all college students. A large share of these non-traditional students are in the 25-34 age range, with enrollments

tapering off beyond that point. Demographers estimate that the pool of likely non-traditional students, which depends on the sizes of the age cohorts and their participation rates, peaked in 1988. Many of the institutions that experienced increased enrollment from this source did so as a result of aggressive marketing efforts to recruit such students and to accommodate their special scheduling needs. Clemson, because of its isolated location, has attracted a lower proportion of non-traditional students than many other institutions and will thus be less affected by any decline in this pool of students.

SUPPLY FACTORS: NEW DOCTORATES AND OTHER POTENTIAL FACULTY MEMBERS

The supply side of the market consists of graduate students completing their programs plus professionally trained persons in government, business, self-employment, academic administration, or temporary "unemployment" (voluntary or otherwise), as well as potential part-timers and immigrants. Most attention tends to focus on the traditional pipeline of graduate students, which peaked in 1979. Since that time the pool has shrunk and has also shifted heavily toward non-U.S. residents. In 1962, 86 percent of graduate students were natives; by 1987, that figure had dropped to 72 percent, with lower ratios in many technical disciplines. These non-American students as a group are less promising as potential faculty members both because they are more likely to return to their native countries and because, in many cases, language difficulties make them less satisfactory candidates for teaching positions.

According to Bowen and Sosa, there are also more non-academic opportunities for many of those pursuing higher degrees than there were in earlier periods. Thus, they predict a decline in the number of candidates in most disciplines beginning in 1992. In some disciplines, that trend is already visible. They also argue that there has been a decline in the quality of new entrants to academia compared to earlier periods, as do Bowen and Schuster. While quality is hard to measure, Bowen and Schuster do identify a few indicators that "the best and the brightest" are going elsewhere. For example, the percentage of Phi Beta Kappas going into the professoriate has shown a marked decline in the last 40 years.

Salaries are an important determinant of whether individuals choose to pursue graduate study, and academic salaries as well as graduate stipends influence not only graduate study but the choice of an academic career. There has been a relative decline in academic salaries between 1970-71 and 1983-84; academic salaries fell by about 19 percent in real terms while other occupations at least held steady in real wages. Other conditions have deterred potential academicians as well, including higher student loads and more hiring in non-tenure track positions. By 1985, 43 percent of Ph.D.s were pursuing non-academic careers, and there was markedly less interest in academic opportunities.

Thus far, labor market conditions have not appeared to affect satisfaction of departments and administrators with their new hires. Bowen and Schuster find generally high satisfaction with junior faculty in terms of quality, particularly in terms of scholarly research activity. However, the projected labor market satisfaction of hiring candidates is likely to decline as the pool of applicants shrinks and the number of vacancies to be filled rises.

EARLY RETIREMENT/MANDATORY RETIREMENT

Two other factors that may affect the need for new hires are early retirement, now an option in South Carolina at 25 years of service and 55 years of age, and the end of the mandatory retirement by age 70 for all U.S. college faculty in 1994. Currently the average age of retirement is 66. A recent economic study, reported in the *Chronicle of Higher Education*, finds that the end of mandatory retirement has little influence on faculty retirement plans. The study found that the nature and level of retirement benefits available was significant, however. Professors at public institutions, which tend to have "defined benefit" plans, retire at an average age two years younger than their counterparts at private institutions, which are more likely to have "defined contribution" plans. Early retirements are quite difficult to predict, especially in South Carolina where this option has just become available in the last year. The South Carolina plan does not offer strong financial inducements. The number taking advantage of the option is likely to be sensitive to the state of the economy and particularly, the availability of other employment opportunities.

STAPLETON: A DISSENTING VIEW

David Stapleton examines the academic labor market from an economic perspective and reaches much more sanguine conclusions about the ability of the market to adapt to fluctuations in demand.⁷ Although his study specifically considers the market for academic economists, his conclusions can be extended with qualifications to many other disciplines, particularly those disciplines where there is a substantial non-academic market for persons holding doctorates.

Stapleton questions the accuracy of enrollment forecasts, pointing out that colleges and universities compensate for cohort size by adjusting admissions standards to some extent. This adjustment, along with heavy recruiting on non-traditional students, helped to maintain enrollments despite a smaller group of high school graduates in the last decade. In addition, Stapleton points out that not all demand for faculty is linked to enrollment, since many faculty members also have research and administrative appointments.

Stapleton also observes that there are "quality" adjustments. When there is an excess supply, candidates for positions must have degree in hand from a good university and several publications. When there is excess demand, colleges will hire faculty members from lesser institutions who are still writing their dissertations—a pattern frequently observed at Clemson. The School of Accountancy, for example, is currently hiring junior faculty at the dissertation state because of market conditions and strong non-academic job opportunities for persons with doctorates in accounting. In addition, there is some possibility of flow between related disciplines. Economists, for example, have been known to teach management courses and management faculty frequently are qualified to teach economics courses as needed. Salaries adjust to the state of the market, as do working conditions, attracting (or repelling) candidates with non-academic alternatives. Individuals with master's degrees are used to teach introductory courses, sections are made larger, and other kinds of adjustments are made in the instructional process.

Stapleton's caveats about the credibility of dire forecasts of shortages are well taken. However, some of the enrollment maintenance in the face of a shrinking pool of high school graduates in the 1980s was a result of the reaction by colleges and universities to the forecasts. Thus, the forecasts were not so much inaccurate as self-negating. These forecasts called forth a response that might not have occurred without the prediction and thus staved off some of the more severe effects of smaller cohorts of traditional students. The forecasts for the academic labor market, likewise, call for universities to anticipate and protect themselves from recruiting and staffing problems that are likely to occur in the absence of actions to forestall those problems.

III. DISCIPLINE SPECIFIC CONDITIONS

The prospects for faculty shortages vary considerably among disciplines, depending on the age distribution of faculties, the size of the pool of potential faculty in the pipeline, the availability of alternative employment, and changing student enrollment. This section identifies some of the broad trends in various disciplines and groups of disciplines nationally and at Clemson University.

AGRICULTURE AND NATURAL RESOURCES

The departments in the College of Agriculture and Natural Resources are encountering an aging faculty and, in some cases, diminishing enrollments. A pickup in enrollment in agricultural disciplines in 1989 and 1990, partly due to the STEP program, had halted a steady decline from 9 percent of undergraduates in 1980 to less than 6 percent in 1990. (See Figure 1, appendix). In addition, demand in this college is less enrollment driven than in some other colleges, because the college has substantial research and extension obligations.

On the retirement side, 19 faculty members in this college are eligible to retire by 1995, and another 21 by the year 2000, or 31 percent of the total faculty. In the faculty survey, 58 percent responded; 20 percent of the total faculty (34 percent of respondents) indicated plans to retire during the current decade. Agricultural engineering and animal science face the greatest losses to retirement, with six faculty in each discipline eligible for full retirement by 1995. Agronomy has only one retirement expected by 1995 but five more by the end of the decade. Plant pathology, likewise, has only one pending retirement from its present ten member faculty, but four more will be eligible by the end of the decade. The average full professor is over sixty, a pattern replicated in agricultural disciplines across the nation.

With 13 departments, the situation facing agriculture is highly diverse. Demand is strong in some disciplines, such as animal science, agricultural economics, plant physiology, and horticulture. In others, such as agronomy, there are fewer employment opportunities. Several departments report little difficulty recruiting but an increasing share of non-native applicants and a limited number of graduate students in the pipeline. While industry experience is useful, most departments (except perhaps for food science) recruit in traditional academic markets with little crossing between academic and non-academic positions.

ARCHITECTURE

The College of Architecture offers traditional architectural disciplines—architectural studies, building science, and landscape architecture—as well as some cross-disciplinary programs sometimes located elsewhere in other universities, planning studies and visual arts/art history. The Office of Institutional Research identifies six faculty members eligible to retire before 1995 and another six by 2000, or 30 percent of the current faculty. (Of those responding to the faculty survey, five reported plans to retire.) Architecture has a very modest but steady share of total undergraduate enrollments, ranging from 3 percent to 4.5 percent over the last decade. (See Figure 1, appendix.)

Architecture (including building science) is one of several academic disciplines that competes as a minority buyer in a marketplace that also sees considerable non-academic demand. The terminal degree in architecture is a master of architecture, which is a professional degree for private practice as well as the terminal degree for an academic appointment. Thus, conditions for hiring architecture faculty are greatly influenced by non-academic demand. In Visual Arts/Arts History, where the terminal degrees are the MFA and the Ph.D. (art history), there is no anticipated shortage of qualified faculty.

COMMERCE AND INDUSTRY

Because of rapid expansion of demand for business degrees in the 1980s, the faculty in these disciplines are relatively young. Nationally, 74 percent of business faculty are under the age of 50, much younger than those in the sciences, humanities, and engineering. Thus, replacement demand will be relatively modest. This pattern is borne out at Clemson, where there are only two faculty members in business and economics eligible to retire by 1995 and another five by the end of the decade. At 10 percent, the projected retirement rate for this college is the lowest of the nine colleges, an expectation borne out by the faculty survey (12 percent plan to retire by 2000). Enrollment rather than replacement will drive demand for business faculty.

Business disciplines in general are experiencing declining enrollment after boom years in the 1980s. A survey by the American Council on Education found that only 18.4 percent of freshmen in 1990 chose a business major, down from 24.6 percent in the peak year of 1987. Demand for business majors at Clemson remains strong, however. The share of business majors in total undergraduate enrollment has seen some fluctuations, with a peak at 28 percent in 1988, but the current share of 24 percent is about the same as it was in 1980 and higher than in some of the intervening years. Some of the drop from the 1988 peak (see Figure 2, appendix) is due to higher admission standards to the College of Commerce and Industry, and some is due to higher out-of-state tuition and restricted out-of-state admissions, since this college had been drawing about 50 percent of its students from out-of-state.

The traditional business disciplines represented at Clemson University are accounting, management, marketing, and finance. A recent study of the market for faculty in accounting was presented in *Issues in Accounting Education*. This study, by Campbell, Hasselback, Hermanson, and Turner, foresees a faculty shortage in the next decade in

accounting, a problem that has been in existence for some time. Of an estimated 5,300 accounting faculty in 1990, 10 percent were in the 60 to 65 age range, facing retirement in the very short term.⁸ Another 1,364, or 26 percent, are over the age of 50 and will be approaching retirement age soon. Campbell *et. al* point to a current shortage of suitable candidates for positions, and increasing non-academic opportunities for accounting doctorates. Based on projected retirements and patterns of granting doctorates, they conclude that the cumulative shortage of qualified accounting faculty will continue to grow from its current estimated 101 to over 700 by the end of the decade. These estimates are subject to considerable uncertainty, since accounting is a basic business discipline and business disciplines are beginning to experience a declining share of enrollments.

Economics is housed in the College of Commerce and Industry at Clemson University, but data on faculty positions are usually included with those for the social sciences. As a foundation for business disciplines, a large share of the teaching demand is related to the number of business majors. The study by Stapleton cited earlier suggests that the market for academic economists is somewhat stable, although there is a cobweb pattern of reactions to shortages and surpluses and rising and falling real wages.⁹ Economics is a discipline with a substantial non-academic market for Ph.D.s, so there is always a potential flow between the two markets depending on demand conditions in both academia and industry and government. Because the department is relatively young, only three retirements are projected by the end of the decade.

The School of Textiles, housed in the College of Commerce and Industry, operates in a very thin market on both the supply and demand sides. Faculty come from either the technical (usually chemistry) fields allied to textiles or the managerial side in the industry. With only four colleges in the southeast offering textile programs, recruiting has always been difficult and highly competitive, and can be expected to remain so in the future. Recent increases in undergraduate enrollment in textiles have resulted in a fairly young faculty (with only three retirements projected by the end of the decade); if enrollment continues to grow, there will be a continued need for new faculty.¹⁰

EDUCATION

The pattern of retirements and the replacement pool in education follows the general trends in other disciplines. The College of Education at Clemson will have 10 faculty eligible to retire before 1995 and six more by the end of the decade, or about one-third of its current regular faculty, second only to sciences. In addition, education is confronting some unique problems. First, while there has been some modest increase in overall Ph.D.s awarded in recent years, education has experienced a significant decline in new doctorates. Second, because education doctorates are often sought by in-service teachers or by persons who have had some public school teaching experience, the lag time between bachelor's and doctorate is quite long. The average time it takes to earn a doctorate in education has increased on the average from 6.2 years in 1967 to 7.9 years in 1987. The median total time between bachelor's and doctorate in education is 10.7 years.¹¹

Finally, while higher education is the primary employer of those holding the doctoral degree in many disciplines, in the education field a large proportion of doctorates are

employed in the public school system in various capacities. This group could constitute a pool of potential college faculty over and above newly produced doctorates if colleges were able to compete in terms of salary. At present, salaries in public education for holders of doctorates are higher than those of education faculty, at least in the Clemson area.

A final concern in the market for education faculty is that the impending increase in demand for faculty for replacement comes at a time when faculty expansion is needed to cope with increased enrollment. Nine percent of entering freshmen in 1990 chose education for a major, up from 8.2 percent the previous year. Clemson University has seen an increase in the last two years in education majors from 11 percent of undergraduates in 1988 to about 15 percent in 1990. (See figure 2, appendix.)

ENGINEERING

The shortage of engineering faculty is not a future issue, but one that has been with us for at least a decade. Many tenure-track positions in engineering are unfilled and remain so for long periods of time. The existing problem will become worse with retirements: John Brighton, writing in *Engineering Education*, reports that 25 percent of current engineering faculty will reach the age of 65 by 1995.¹²

Engineering, more than most disciplines, has had to rely on foreign-educated graduate students and foreign-educated faculty to address the chronic shortage of native-born faculty members. The shortages are the result of attractive opportunities in industry for both new bachelors' degree holders who might otherwise attend graduate school and for new Ph.D.s. Lack of qualified candidates for faculty positions has been exacerbated by increased numbers of undergraduate majors, although those numbers have since leveled off. Some of the pressure on engineering faculty may be relieved by a declining share of undergraduate entrance standards. At Clemson University, engineering enjoyed its peak share of undergraduates (about 30 percent) in 1983, with a steady decline since then to about 23 percent in 1990. (See Figure 2, appendix.)

The shrinking pool of undergraduates and the increased proportion of undergraduates accounted for by women and minorities (two groups that are much less likely to major in engineering) has reduced the number of candidates for advanced engineering degrees.

According to Betty Vetter, also writing in *Engineering Education*, there are already significant numbers of unfilled engineering faculty positions, with the highest proportion in computer science and computer engineering.¹³ In the past, engineering has sometimes acquired faculty members from related basic disciplines, such as chemistry, physics, mathematics and computer sciences. However, those disciplines also are facing increasing retirements and a limited pool of Ph.D.s.

At Clemson University, 26 members of the regular engineering faculty are eligible to retire by 1995 with 30 years service, and another 20 by the end of the decade. Of these 46, 25 responded to the faculty survey with plans to retire during that time frame. Thus, engineering will have almost as many retirements as sciences and liberal arts, in addition to having substantial numbers of vacant positions. Within engineering, electrical and

computer engineering has the largest cohort of prospective retirees, with four eligible between 1990 and 1993 and another eight by the end of the decade.

FOREST AND RECREATION RESOURCES

The two departments that make up this college, Forestry and Parks, Recreation, and Tourism Management, continue to enjoy strong student enrollments. (See Figure 1, appendix.) Forestry is anticipating some retirements; two of its faculty members are already eligible to retire, and another will be eligible in 1993, and a fourth in 1998. PRTM, in contrast, has a relatively young faculty, with no one eligible for full retirement benefits until 1996 and only three before the end of the decade. Eleven faculty members who responded to the survey indicated plans to retire during the decade, seven from forestry and four from PRTM. Enrollment in Forest and Recreation Resources remains modest but steady.

There is some competition in both departments between industry and academia for new graduates, creating some instability in supply. Although there is overproduction nationally, Clemson's new graduates have had little difficulty finding jobs. There is likely to be difficulty in filling positions in the future as the market becomes more of a seller's market.

LIBERAL ARTS

The liberal arts disciplines have had a long period of oversupply and underemployment that appears to be coming to an end. With an estimated 85,000 faculty members in 1987, vacancies created by quits/retirements/deaths in the liberal arts disciplines were projected at 16,500 (19.4 percent) from 1987 to 1992, another 14,600 (17.2 percent) from 1992 to 1997, and 14,500 (17 percent) from 1997 to 2002. Nationally, 44 percent of the faculty in humanities and social sciences are aged 50 or older. Humanities, with some current 40,000 faculty, will experience the largest losses nationally, with 7,000 or more exiting in each five year span.¹⁴

At Clemson, one-third of the faculty of the College of Liberal Arts (52 out of 150) were aged 50 or older in 1990, making them candidates for retirement in the next five to ten years.¹⁵ The Office of Institutional Research identified 19 candidates for full retirement in 1990-1995 and another 26 for the period 1996-2000, which is 28 percent of the faculty. Eight of the 19 eligible to retire in the near term are in the English department, with seven more in the last part of the decade. Other departments facing large cohorts of retirees are languages and history. Twenty-eight faculty indicated an intent to retire during the decade in the faculty survey, including nine in English, five in history, and four in languages.

Bowen and Sosa project that supply will continue to exceed demand in the liberal arts disciplines through 1997, but at diminishing rates. The ratio of candidates/openings is currently 1.36, declining to 1.16 in the 1992-1997 period and falling again to .71 in 1997-2002. Only psychology among the liberal arts is expected to continue to have a ratio of candidates to positions greater than one after 1997. While faculty search committees are still receiving large numbers of applications for vacant positions in languages, political

science, English, history, psychology, sociology, and philosophy, this pattern is expected to change dramatically in the next five years, with fewer applications for each position.

This national shortage of candidates for faculty positions in humanities and social sciences is projected to occur in spite of the reduction of the number of students choosing arts and sciences as undergraduate majors. Across the nation, liberal arts' share of majors has fallen from 40 percent of undergraduates in 1970-71 to under 25 percent by the end of the 1980s. Figure 3 in the appendix shows a steady increase in the share of liberal arts majors in the student body at Clemson, however. This increase may reflect local conditions such as good recruiting or strong programs, or may reflect a reversal of national trends at the end of the last decade. Even if there continues to be a preference for more applied majors, all undergraduates still take a large number of credit hours in the liberal arts and humanities. This trend should be strengthened with renewed emphasis on general education. Thus, there should be a continued demand for basic courses in these areas, even if there is a decline in upper division students.

Unlike many other disciplines, humanities and social sciences have a relatively limited pool of practitioners in other lines of work who could be attracted into academia if the opportunity were attractive enough, nor is there a significant exit from most of these disciplines to non-academic related lines of work. Thus, there is perhaps less flexibility in positions requiring doctorates and more pressure to use MAs and ABDs to take up the slack when the supply of faculty is tight.

NURSING

Nursing is experiencing some increases in enrollment, according to the American Council on Education survey. In 1990, 3.8 percent of entering freshmen chose nursing as a major, compared to 2.7 percent the previous year. This figure represents a turnaround from the patterns of the previous decade, showing steadily declining enrollment. Nursing represents a very small but relatively stable share of Clemson enrollment, hovering just at or under 3 percent of total undergraduates. (See Figure 2, appendix.) Strong recruiting efforts have enabled the college to hold its own as the University's freshmen enrollment was reduced.

Salary indicators and hiring rates suggest that nursing faculty were in relatively short supply in the 1980s, which could become a more serious concern in the 1990s if enrollment continues to expand.¹⁶ Until recently, many new hires in nursing, or many faculty seeking advancement by acquiring the terminal degree, held doctorates in education. Others had Ph.D.s in humanities or social science disciplines. Increasingly, however, new applicants are holding the doctoral degree in nursing from relatively new research-oriented doctoral programs, pioneered in the southern region. The supply of candidates is relatively limited, making recruiting difficult. Retirement is not a primary concern. Four of Clemson's nursing faculty are approaching retirement eligibility, all of them toward the end of this decade, and four faculty members indicated an intent to retire on the survey.

SCIENCES

The situation in the basic sciences—mathematics, computer science, physics, chemistry, geology, and the biological sciences—is somewhat similar to that facing the humanities and social sciences, with a few additional complications. Like social sciences and humanities, most of the basic sciences have experienced falling numbers of undergraduate majors. Faculty demand remains high, however, because of the need to service students majoring in the applied disciplines. Clemson has followed national trends in science majors, down from a peak of about 14 percent of undergraduates in 1984 to about 10 percent in 1990 (Figure 3, appendix.) Biological sciences at Clemson represent an exception to this trend, with a large and growing number of majors.

New doctorates awarded in mathematics, chemistry, and physics lie well below their peak levels of the early 1970s. In addition, a particularly high proportion of new doctorates are to foreign-born candidates; in mathematics, for example, 43 are native-born and 57 are foreign-born.

Earth sciences and the biological sciences have held their own in new doctorates awarded nationally, but these disciplines have also seen a sharp increase in doctorates awarded to non-residents. Many of these new Ph.D.s are not planning to stay in the United States or are not suited to teaching positions. Bowen and Sosa estimate a 1.51 ratio of candidates to positions from 1987 to 1992 for the physical sciences and mathematics, followed by a drop to a 1.3 ratio in 1992–1997 and ratio of 0.8 from 1997–2007. The picture for faculty recruiting is somewhat brighter in the biological sciences (including psychology), where the current very high ratio of 2.2 candidates per position drops to 1.84 in 1992–1997 and thereafter to 1.13.¹⁷

Two other complications make the picture more difficult for the basic sciences. One is non-academic demand for research scientists, particularly in governmental and industrial research programs, which is extremely volatile. Government cutbacks dump research scientists on the academic market, while expansions in government or industry research compete actively and effectively with academia for new Ph.D.s. These sources of competing demand and complementary supply make the situation in the physical and biological sciences more difficult to project than the humanities and social sciences. Microbiology and chemistry report particularly intense competition with industry for candidates.

The other complications in sciences is the age of the current faculty. As indicated earlier, the number of positions vacated by retirement or death is a function of the average age and years of service of the current faculty. The disciplines with the most projected exits due to age/retirement nationally is physics and astronomy, where almost half the faculty were 50 years of age or older in 1987. Except for physics and astronomy, basic sciences faculty members across the country are younger than their counterparts in humanities and social sciences. Only 31 percent of mathematicians were 50 or older in 1987, and chemistry was the only other basic science discipline (besides physics and astronomy) with over 40 percent (41.8 percent) of its members over the age of 49.¹⁸ For microbiology, the average age is only 46. Replacing retiring faculty is particularly costly in the sciences because of the high startup cost of equipping laboratories.

The situation with respect to retirement and replacement in the physical and biological sciences at Clemson mirrors the national pattern. The Office of Institutional Research identified 33 faculty members in the sciences eligible for full retirement benefits in 1990-95, and another 26 for the period 1996-2000, for a total of 39 percent of the faculty. Chemistry will have nine of its 33 faculty eligible for full retirement between now and 1995, and another two by 1997. Physics has already lost five faculty members to retirement in the last three years, with 10 eligible to retire by 1995 and five more by the end of the decade. Mathematical sciences has 10 faculty members eligible to retire by 1995 and 11 more by the year 2000. In biological sciences, four faculty members are over the age of 50. Several are approaching 30 years of service. Microbiology anticipates only one retirement in the next five to six years. Other disciplines in the college are less vulnerable to imminent retirement. In the faculty survey, 44 faculty members indicated plans to retire, with 14 in math sciences, eight each in physics and biological sciences, seven in chemistry, and three in earth sciences.

Computer science is housed in the College of Sciences at Clemson University, but is often included in studies of engineering rather than science faculty nationally. Such reports describe severe current and projected shortages of faculty in both computer engineering and computer science, based on the experience of the 1980s. Because this discipline is relatively new, most of its faculty are young; a 1987 study found that 82 percent of computer science faculty were under the age of 50. Thus, both nationally and at Clemson, computer science is unlikely to face the kind of retirement pressures that are being experienced by older, more established disciplines.¹⁹

Computer science at Clemson and nationally finds itself in a peculiar position, with increasing demand expected for its graduates but a sharp drop in undergraduate enrollment in the last year or two after a surge of popularity in the 1980s. Thus, projections of faculty demand in this discipline based on undergraduate enrollment from just a year or two ago are now quite suspect.

LIBRARY

Librarians in universities and colleges constitute a minority of the profession. Only 25 percent of professional librarians work in academia, with the rest in government, public schools, and non-profit organizations or industry. The market for librarians has been one of excess demand (more openings than qualified personnel) for some time, and college and university employers must scramble to fill vacancies. Salaries have been increasing slightly faster than the inflation rate.²⁰ In the faculty survey, three members of the library faculty indicated plans to retire during the decade.

IV. POLICY CONCLUSIONS

Just as the declining pool of traditional undergraduates called forth creative responses from colleges and universities, the prospect of a tight faculty labor market in the next decade can also be expected to challenge the imaginations of college administrators.

Financial pressures may limit the ability of institutions to compete with salary offers, and in public institutions there is limited flexibility in competing with reduced teaching loads or fringe benefits (especially when, as at Clemson, faculty are state employees.)

Lozier²¹ offers several suggestions for recruiting and retaining faculty in a tight market, including seeking out persons with appropriate credentials from outside of academe, re-examining retirement policies, and offering better graduate stipends to increase the pool of future faculty. Another traditional response to tight labor market conditions has been to use more junior faculty in the introductory courses, provided that they have at least a master's degree. This policy has led in the recent past to a class of academic gypsies who float from institution to institution with little hope of permanent employment, creating some problems for educational quality control.

With the situation particularly acute in the sciences, all colleges and universities need to be more attuned to the process of how students are prepared to choose a college major and how that process can be modified to encourage more science majors. Of the 24,000 public high schools in the U.S., 7,000 do not offer physics, 4,000 do not offer chemistry, and 2,000 do not offer biology. Even where science courses are offered, many of them do not provide hands-on science experience.²² Clemson University is already making some important contributions to public school science education, and should continue to move in this direction in order to play a role dictated by its mission, developing the next generation of basic scientists.

Still another solution that evolves in tight markets is to return to the policy of hiring promising potential rather than proven track records, i.e., hiring ABDs rather than Ph.D.s with one or more publications on their resumés. This solution bridged the previous labor shortage of 30 years ago at many colleges, and is likely to be used again in the 1990s.

Because of the varied situations facing different disciplines, no single policy will apply to all of them, although there are some common solutions. Each discipline needs to assess its own situation both nationally and at Clemson, and determine an appropriate strategy for maintaining a quality faculty in the 1990s. Many disciplines have assessed the academic market nationally and identified some strategies; mathematics, for example, has produced a study entitled *A Challenge of Numbers* that looks at undergraduate enrollments, graduate enrollments, faculty replacement demand, industrial competition, and other factors and offers recommendations to recruit and train the numbers of mathematicians needed to meet projected demand.

Clemson University as a whole faces some unique challenges and opportunities relating to its location in a natural wonderland that is somewhat geographically isolated. The lakes, mountains and mild climate will attract those interested in outdoor recreation. The attraction for students (and their parents) in such an environment is quite strong, and helps to explain Clemson's continuing high level of quality applicants as other schools struggle harder to maintain enrollments. The geographic isolation, however, is a deterrent to recruiting minorities and single persons for the faculty, because these two groups can usually find a more congenial social environment in a more urban area. Minorities and

single persons make up an increasing share of the talent pool on the academic labor market. Even among married candidates, more and more academic households are pursuing two careers, and the opportunities for spouse careers are much greater in urban areas. This recruiting disadvantage is a concern to fields with a high proportion of women and minorities, but also represents a handicap in attracting more of the increasing pool of married women academics across all disciplines. Clemson's geographic isolation also limits the opportunity to collaborate with industry on research, particularly important in some of the applied disciplines. Thus, Clemson University needs to explore better ways to sell its natural, intellectual and cultural climate. Perhaps we need to explore ways to address the social needs of single faculty as well.

The small community and close personal ties are likely to keep retired faculty in the area as a pool of potential experienced and flexible part-timers. This pool offsets the lack of an alternative group of part-time faculty in business and industry in urban areas with suitable academic credentials that more urban institutions enjoy. As more faculty approach retirement, Clemson University needs to make a conscious effort to determine which ones can remain a useful and effective part of the faculty after retirement and to consider what inducements can be offered to retain some of these professors, perhaps on a part-time basis.

Like any institution with an extensive graduate program, Clemson is on both sides of the market. We need to be working harder at encouraging our own best students to consider academic careers and to prepare our graduate students for the teaching as well as the research side of the academic profession. While many of the benefits will accrue to other institutions, some will remain at home, particularly in training and supervising teaching assistants to maintain educational quality for our undergraduates.

Any tight market represents both a challenge and an opportunity. More competition for faculty in most disciplines is a virtual certainty. Clemson University needs to plan, prepare, and anticipate in order to continue to provide leadership in quality education in South Carolina, the Southeast, and the nation in the years to come.

APPENDICES

FACULTY RETIREMENT SURVEY

PURPOSE:

As a strategic planning issue, to determine retirement plans of full-time faculty members at Clemson University.

SURVEY ADMINISTRATION AND METHODOLOGY:

During Fall of 1991, 1250 surveys were sent to those holding faculty rank at Clemson University. For the purpose of this survey, faculty employed at Research Stations across the state are listed together under Agricultural Sciences.

RESULTS:

701, or 56.40 percent of the Clemson faculty members responded to the survey. Of those, 57 (4.6 percent of all faculty) faculty members reported that they would retire between now and the end of 1993. 91 (7.3 percent) planned to retire after 1993 but no later than 1997, and 58 (4.7 percent) responded that they would retire after 1998 but no later than 2000. 495 (39.8 percent) of those surveyed had no plans to retire in the next ten years. Note that the estimates of percentages planning to retire are conservative, because there are undoubtedly some nonrespondents who do, in fact, plan to retire over the course of the next decade. More specific information is given for each college below.

COLLEGE OF AGRICULTURAL SCIENCES

161 out of 276, or 58.3 percent of the faculty in the College of Agricultural Sciences, responded to the survey. Overall, 18 (6.5 percent) members of the College reported they would retire by 1993. 21 faculty (7.6 percent) planned to retire after 1993 but no later than 1997, and 16 (5.8 percent) indicated that they would retire no later than 2000. 106 (38.4 percent) had no plans to retire in the next decade.

Particular departments will be more affected by faculty retirement plans than others. Eight of the 27 faculty members in Agricultural Engineering (29.6 percent) plan on retiring in the next decade, as do 11 of the 29 faculty members in Animal/Dairy/and Veterinary Science (37.8 percent). Four out of nine (44.4 percent) Extension Service faculty indicated they would retire before the year 2000. 45.5 percent of the Home Economics staff reported that they planned on retiring before 2000. Three out of seven faculty (42.9 percent) in the 4-H/Youth program planned to retire after 1993 but no later than 1997.

COLLEGE OF ARCHITECTURE

27 out of 58 faculty members (46.55 percent) responded to the survey. Only five members (8.5 percent) of the faculty indicated that they plan to retire by 2000.

Three out of 28 faculty in Architectural Studies (10.7 percent) indicated they would retire before 2000. Two out of 16 of the faculty in Visual Arts and History (12.6 percent) plan to retire by 2000.

COLLEGE OF COMMERCE & INDUSTRY

65 out of the 141 faculty members (46.10 percent) responded to the survey. Of these, 17 faculty members (12 percent) indicated that they plan to retire in the next decade.

Five out of 26 (19.2 percent) faculty in the school of Accountancy plan to retire by 2000, as do five members (14 percent) of the faculty in Management. In the School of Textiles, four out of 17 faculty members (23.6 percent) indicated they would retire in the next ten years.

COLLEGE OF EDUCATION

44 out of 76 faculty in the College of Education (57.89 percent) answered the survey. 14 out of 76 (18.3 percent) of the faculty plan to retire by 2000, while 30 faculty members (39.5 percent) indicated they had no plans to retire in the next ten years.

10 out of 56 faculty (17.9 percent) in the department in Elementary and Secondary Education plan to retire by 2000, and four out of 20 faculty (20 percent) in Industrial Education indicated they would retire no later than 1997.

COLLEGE OF ENGINEERING

92 out of 153 (60.13 percent) faculty in the College of Engineering responded to the survey. Five out of 153 (3.3 percent) plan to retire by 1993, and 15 (9.8 percent) indicated they would retire no later than 1997. Five (3.3 percent) indicated they would retire before 2000. 67 out of 153 (43.8 percent) have no plans to retire in the next ten years.

Three out of 12 (25 percent) faculty in Chemical Engineering indicated they plan to retire before 2000. In Civil Engineering, Four out of 22 (18.1 percent) faculty responded they would retire no later than 1997. Eight out of 38, or 21 percent of the faculty in Electrical and Computer Engineering, plan to retire before 2000.

COLLEGE OF FOREST AND RECREATION RESOURCES

35 out of 62, or 56.45 percent, of the faculty responded to the survey. Four members (6.5 percent) plan to retire by 1993, and four members (6.5 percent) indicated they would retire no later than 1997. Three faculty (4.8 percent) indicated they would retire before 2000. 24 out of 62 (38.7 percent) faculty have no plans to retire in the next ten years.

In the area of Forest Resources, seven out of 37 faculty (18.9 percent) plan to retire before 2000. In PRTM, four out of 25 (16 percent) indicated they would retire before 2000.

COLLEGE OF LIBERAL ARTS

127 out of 202, or 62.87 percent of the faculty in the College of Liberal Arts answered the survey. 28 of the 202 faculty members (14 percent) plan to retire before 2000, while 99 members (49 percent) indicated they had no plans to retire in the next ten years.

Five out of 24, or 20.9 percent, of the History faculty plan to retire before 2000. In Political Science, three out of 10 faculty (30 percent) indicated they plan to retire in the next ten years, as did four out of 11 members (30.8 percent) of the Sociology Department.

COOPER LIBRARY

13 out of 26, or 50 percent, responded to the survey. Three members (11.5 percent) indicated they would retire after 1993 but no later than 1997. 10 out of 26, or 38.5 percent had no plans to retire in the next decade.

COLLEGE OF NURSING

25 out of 39, or 64.10 percent, of the Nursing faculty answered the survey. Four faculty (10.3 percent) reported they would retire after 1993 but no later than 1997. 21 members (53.8 percent) had no plans to retire.

COLLEGE OF SCIENCES

112 out of 210 (53.33 percent) responded. 13 faculty (6.2 percent) plan to retire by 1993; 18 faculty (8.6 percent) will retire after 1993 but no later than 1997; and 13 (6.2 percent) will retire after 1998 but no later than 2000. 68 out of 112 (32.4 percent) had no retirement plans before 2000.

Eight out of 35 (22.9 percent) faculty in the Biological Sciences Department plan to retire before 2000, as do 14 out of 56 members of the Math Sciences Department (25 percent). Seven out of 36, or 19.4 percent of the Chemistry Department indicated they would retire no later than 1997. In Earth Sciences, three out of nine (33.3 percent) plan to retire no later than 1997. In the next ten years, eight of the 28 members of the Physics Department plan to retire (28.5 percent).

CONCLUSIONS

The College of Sciences will be the most affected by retirement in the coming decade. Further complicating the problem is the shortage of students entering those fields. Enrollment in the College of Sciences at Clemson peaked in 1984 at 1701. Since that time, enrollment has fluctuated. Because this is a nationwide problem, Clemson will find itself competing with other institutions and private industry for qualified faculty. Physics and Earth Sciences will be particularly impacted by retirement plans in the next ten years.

The College of Agricultural Sciences will also feel the effects of faculty retirement. Clemson's enrollment has risen, even as nationwide enrollment in agricultural fields has been decreasing, so Clemson will be active in this market for both replacement and expansion.

While the College of Engineering will only lose 16.4 percent of its faculty before 2000, it too will be affected by a shortage of graduate students entering academia. Even though enrollment at Clemson is at an all-time high in the College of Engineering (3781 students), the competition for these students is keen. Universities can not match the salaries paid by private industry, so many potential teachers forego graduate study for employment. It is important that steps be taken to attract students to the teaching arena.

The College of Architecture and the College of Nursing appear to be our "youngest" colleges, and will not be severely affected by retirements in the next decade.

APPENDIX 2

The following graphs track enrollment by college from 1980 to 1990. The data for the graphs was supplied by David Fleming of the Office of Institutional Research.

SHARE OF UNDERGRADUATE ENROLLMENT

AGRICULTURE, ARCHITECTURE, FOREST & RECREATION RESOURCES

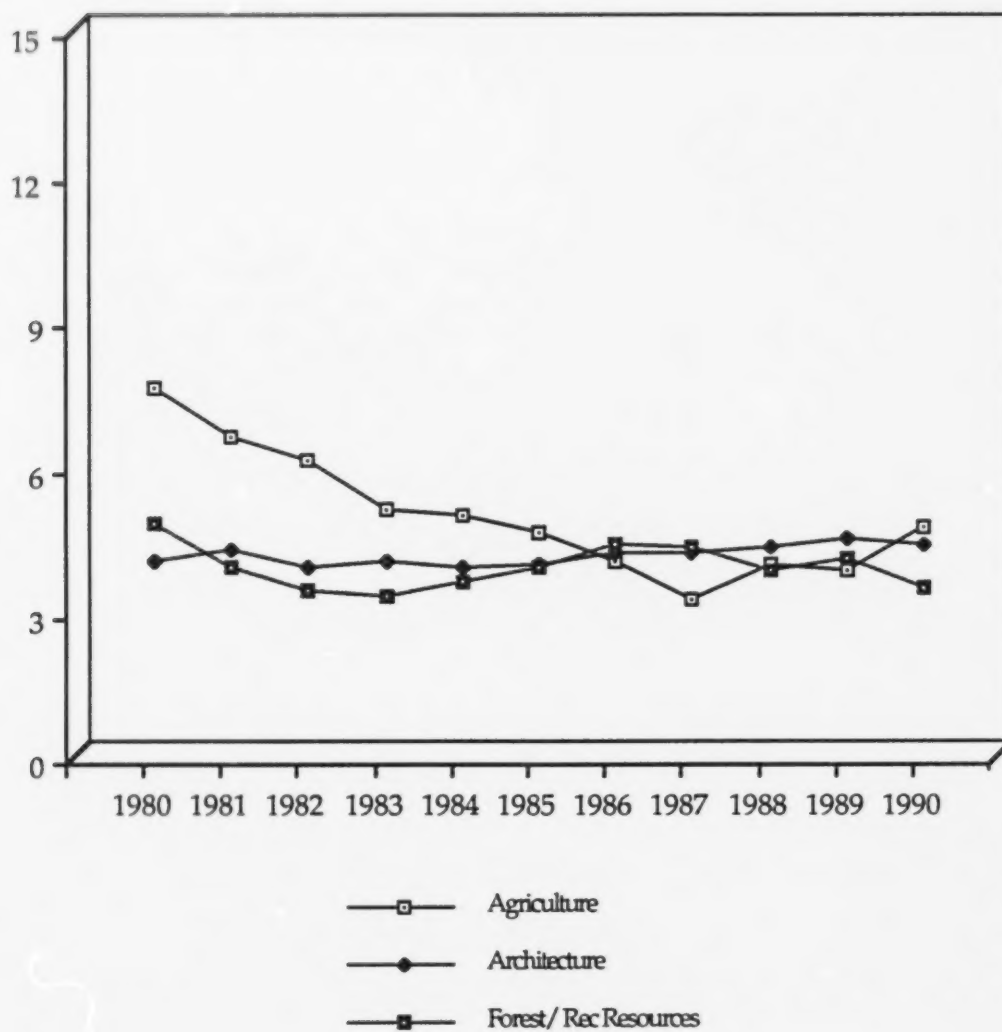


FIGURE 1

SHARE OF UNDERGRADUATE ENROLLMENT

COMMERCE & INDUSTRY, EDUCATION, ENGINEERING

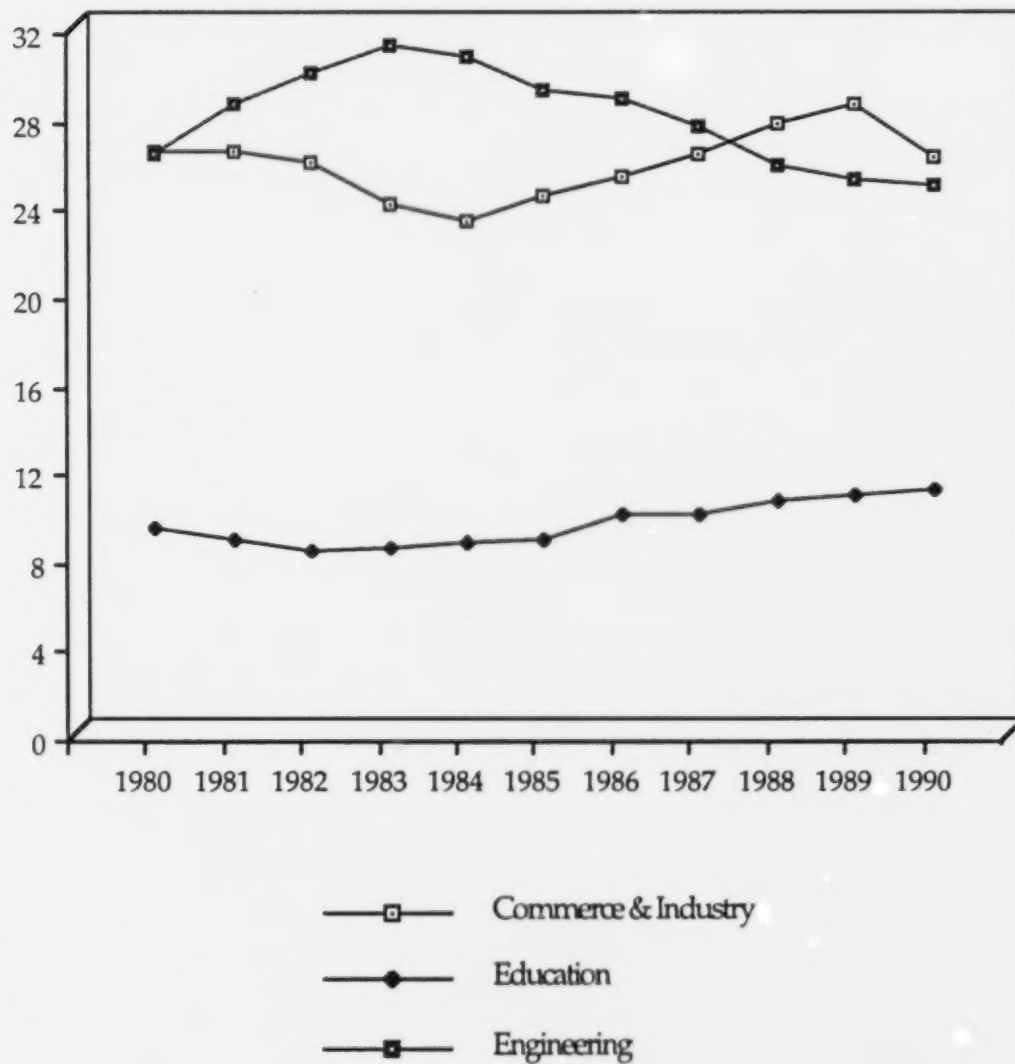


FIGURE 2

SHARE OF UNDERGRADUATE ENROLLMENT

LIBERAL ARTS, NURSING, SCIENCES

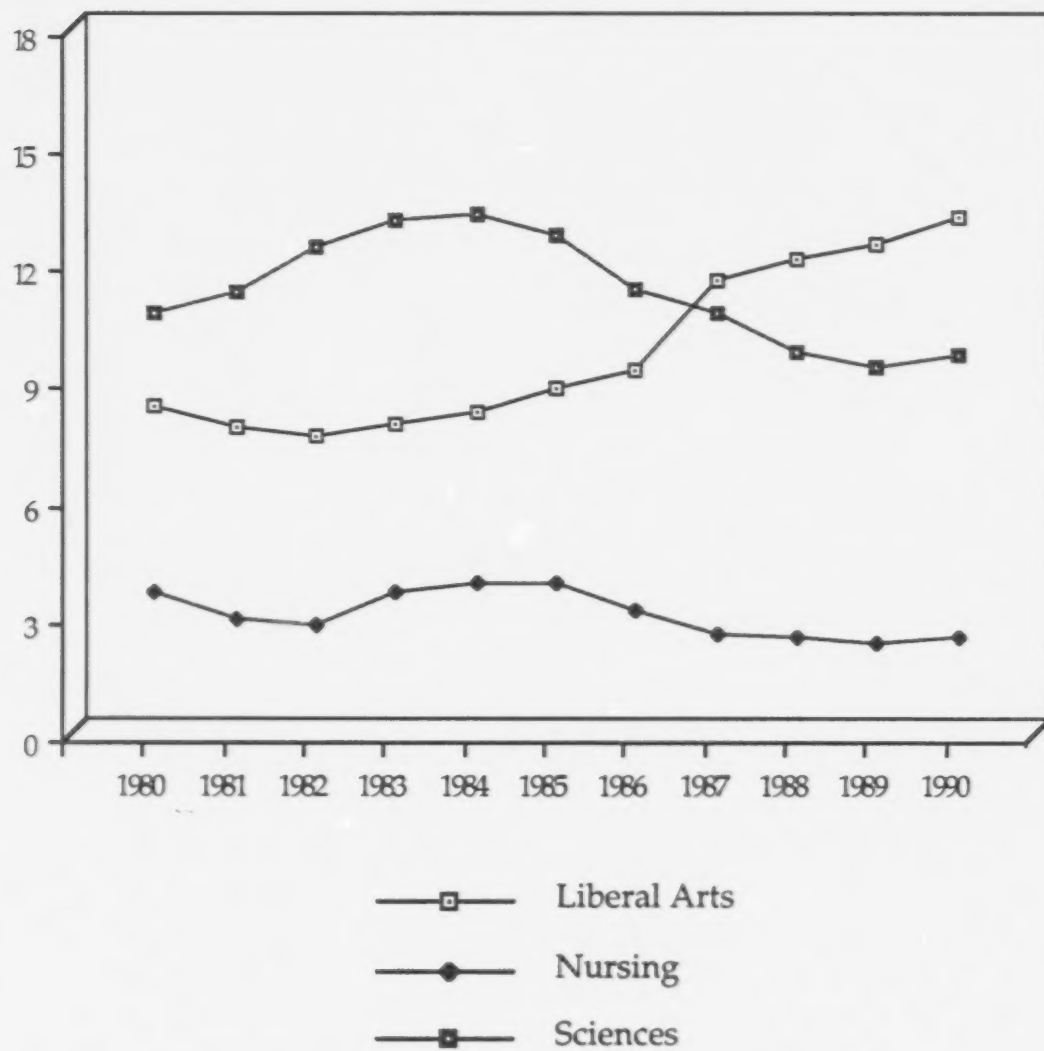


FIGURE 3

FOOTNOTES

1. Bowen, William, and Julie Ann Sosa. *Prospects for Faculty in the Arts and Sciences*, Princeton University Press, 1989, p. 19.
2. Oxford University Press, 1986.
3. National Center for Education Statistics, *Faculty in Higher Education Institutions*, 1988. Contractor Report to U.S. Department of Education, Office of Educational Research and Improvement, NCES90-365.
4. Detailed breakdowns by subperiod and department are available on request.
5. Arthur Levine and Associates, *Shaping Higher Education's Future: Demographic Realities and Opportunities, 1990-2000*, Jossey-Bass Publishers, San Fransisco, 1990.
6. Leatherman, Courtney. "End of Mandatory-Retirement Policies Seen Having Little Effect on Professors," *Chronicle of Higher Education*, A13-14, January 9, 1991.
7. Stapleton, David C. "Cohort Size and the Academic Labor Market." *Journal of Human Resources*, Spring 1989.
8. Campbell, Terry L., James R. Hasselback, Roger H. Hermanson, and Deborah H. Turner. "Retirement Demand and the Market for Accounting Doctorates." *Issues in Accounting Education*, Vol. 5, No. 2, Fall 1990, p. 209-221.
9. Stapleton, *op. cit.* The cobweb is an economic model describing the process of adjustment of quantity and price in a market where there is a long production lead time. The result of responses to price (or salary and working conditions) is alternating periods of shortages and surpluses as the economy converges on equilibrium.
10. Personal communication from Dr. Douglas Rippy, Head, School of Textiles, Clemson University.
11. J. Evangelauf, "Lengthening of Time to Earn a Doctorate Causes Concern," *Chronicle of Higher Education*, 35: March 15, 1989.
12. John A. Brighton, "Engineering Faculty for the 1990s and Beyond," *Engineering Education*, July/August 1989, p. 536-539.
13. Betty Vetter, "Replacing Engineering Faculty in the 1990s," *Engineering Education*, July/August 1989, p. 540-46.
14. Bowen and Sosa, *op. cit.*, Chapter 4.
15. Demographic data supplied by Dean Robert Waller of the College of Liberal Arts.

16. Howe, Richard D. and Fredel T. Reighard. "Salary Trend Study of Faculty in Nursing for the Years 1984-85 and 1987-88," ERIC Research Report ED 302157.
17. Bowen and Sosa, *op. cit.*, Chapter 4.
18. Lozier, G. Gregory and Michael J. Dooris. "Is Higher Education Confronting Faculty Shortages?" Office of Planning and Assessment, Pennsylvania State University, 1987.
19. Lozier, *op. cit.*
20. Learmont, Carol and Stephen van Houten, "Placement and Salaries 1989," *Library Journal*, October 15, 1990, p. 46-52.
21. Lozier, *op. cit.*
22. Hatfield, Mark O., "Federal Initiatives to Produce More Scientists," *ASM News*, Vol. 56, No. 1, 1990, p. 22-23.
23. Committee on the Mathematical Sciences in the Year 2000. *A Challenge of Numbers: People in the Mathematical Sciences*. National Academy Press, 1990.